REMARKS

Reconsideration and reexamination of this application, as amended, are respectfully requested. Claims 12-14 and 16-18 are pending in this application upon entry of this Amendment. The Applicant has amended independent claims 12 and 16. No claims have been cancelled or added.

The Applicant has amended independent claims 12 and 16 to more clearly recite that the method and system of the claimed invention are for use with magnetic tape having data blocks and a parity block serially arranged on a track of the magnetic tape with the parity block following the data blocks.

Status of Claims

Box 4 in the Summary of the final Office Action indicated that claims 1-18 are pending and that claims 1-11 and 15 have been withdrawn from consideration. The Advisory Action indicated that claims 1-11 and 15 have also been withdrawn from consideration. In the Amendment filed on September 20, 2002, the Applicant cancelled claims 1-11 and 15. As such, claims 12-14 and 16-18 are pending.

Claim Rejections – 35 U.S.C. § 103

In the final Office Action, the Examiner rejected claims 12-14 and 16-18 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,018,778 issued to Stolowitz ("Stolowitz") in view of "Single and Adjacent Double Error Correction System," IBM Technical Disclosure Bulletein ("IBM"). The Applicant believes that the claimed invention is patentable over any combination of Stolowitz and IBM and has amended independent claims 12 and 16 to more clearly define thereover.

1. The Claimed Invention

The claimed invention, as recited in amended independent claims 12 and 16, is a method and an associated system for providing data blocks from a magnetic tape to a host. The method and system are for use in a "single magnetic tape RAIT" environment. Such a single magnetic tape RAIT environment includes a magnetic tape having data blocks and a parity block serially arranged on a single track of the magnetic tape with the parity block following the data blocks. The parity block is based on the data blocks as conventionally known.

The method includes reading the data blocks sequentially from the track of the magnetic tape and determining if the data block currently being read is good or bad. The data block currently being read is provided to the host if the currently being read data block does not follow a bad data block. If one of the data blocks is bad, the method includes storing the good data blocks following the bad data block in sequential order.

Parity of the good data blocks is accumulated as the data blocks are being read. The parity block is then read from the track of the magnetic tape after all of the data blocks have been read. If one of the data blocks is bad, the bad data block is then reconstructed from the accumulated parity of the data blocks and the parity block in order to form a reconstructed good data block. The reconstructed good data block is then provided to the host and then the stored good data blocks are provided to the host in sequential order.

2. Stolowitz and IBM

In the final Office Action, the Examiner noted that Stolowitz does not disclose a magnetic tape having data blocks and a parity block in which the data blocks and the parity block are serially arranged on the magnetic tape with the parity block

following the data blocks and the parity block being based on the data blocks. The Examiner posited that IBM discloses a magnetic tape that has channels which are tracks on a magnetic tape and the channels comprising both data and parity. The Examiner posited that it would have been obvious to use a magnetic tape in the redundant storage system of Stolowitz. The Examiner posited that one skilled in the art would have been motivated to make the modification because as indicated in the Figure of IBM the data and parity coming from the tape is applied to a multiplexor much the same way as the data and parity coming from the disk array in Stolowitz.

3. The Claimed Invention Compared with Stolowitz and IBM

The claimed invention generally differs from any combination of Stolowitz and IBM in that the claimed invention is directed to an implementation of RAIT on a track of a single magnetic tape. As such, the data blocks and the parity block are serially arranged on a track of the magnetic tape with the parity block following the data blocks. The data blocks are read sequentially from the track of the magnetic tape and then the parity block is read from the magnetic tape after all of the data blocks have been read.

Stolowitz is directed to conventional RAID and RAIT configurations which employ multiple disks and/or tapes such as found in a disk drive array. Such conventional configurations are useful when the loss of a whole device drive occurs. In contrast, a common failure mode of a magnetic tape is the loss of a data block as opposed to the failure of the entire tape. In such single tape reading applications, the access to the track of the tape is sequential in which previous data is read before current data is read. As such, the parity block is on the track of the tape after the serially arranged data blocks. The claimed invention takes advantage of these configurations in order to provide higher speed operation in the event of read errors for single tape RAIT implementations.

The Applicant believes that modifying Stolowitz with the teachings of IBM would not result in the claimed invention. This is because the claimed invention is directed to an implementation of RAIT on a track of magnetic tape as the data blocks and the parity block are serially arranged on the track of the magnetic tape with the parity block following the data blocks. In contrast, IBM discloses a magnetic tape that has tracks (for instance, 22 tracks as shown in the Figure of IBM) with some of the tracks having data (I) or parity (C) of a sub-group (S).

As described by IBM, as an example, the sub-group S(1) is: C(1) + I(1) + I(2) + I(3) + I(5) + I(7)+ I(9) + I(11) + I(15) + I(16). As shown in Figure of IBM, the data and parity bits of a sub-group are individually arranged on different tracks as opposed to a single track as in the claimed invention. As further shown in the Figure of IBM, the parity C(1) bit is positioned between I(5) and I(7) data bits and, consequently, does not appear to follow all of the data bits as in the claimed invention. The Figure of IBM also appears to show that the tracks containing data bits are read in parallel, as opposed to sequentially, by encoder 10.

Thus, a difference between the claimed invention and IBM is that in the claimed invention the data blocks and the parity block are serially arranged on a track of the magnetic tape with the parity block following the data blocks. The data blocks are then sequentially read from the track of the magnetic tape with the parity block being read after the data blocks have been read. As such, the claimed invention is directed to a single magnetic tape RAIT environment in which the data and parity blocks are arranged on a single track of a magnetic tape whereas the data and parity bits of IBM are arranged on multiple tracks of a magnetic tape. Accordingly, modifying Stolowitz with IBM would not result in the claimed invention.

In view of the foregoing amendments and remarks, the Applicant believes that independent claims 12 and 16 patentably distinguish over Stolowitz. Claims 13-14

and 17-18 depend from one independent claims 12 and 16. Therefore, the Applicant requests reconsideration and withdrawal of the rejection to the claims under 35 U.S.C. § 103(a).

CONCLUSION

In summary, claims 12-14 and 16-18, as amended, meet the substantive requirements for patentability. The case is in appropriate condition for allowance. Accordingly, such action is respectfully requested.

If a telephone or video conference would expedite allowance or resolve any further questions, such a conference is invited at the convenience of the Examiner.

Respectfully submitted,

STEPHEN FULD

James N. Kallis
Reg. No. 41,102
Attorney for Applicant

Date: January 23, 2003

BROOKS & KUSHMAN P.C.
1000 Town Center, 22nd Floor
Southfield, MI 48075
Phone: 248-358-4400
Fax: 248-358-3351

Attachment

MARKED UP VERSION OF APPLICATION CHANGES

IN THE CLAIMS:

Please replace claims 12 and 16 as shown below.

12. (TWICE AMENDED) In a magnetic tape having data blocks and a parity block in which the data blocks and the parity block are serially arranged on a track of the magnetic tape with the parity block following the data blocks and the parity block being based on the data blocks, a method for providing the data blocks from the track of the magnetic tape to a host, the method comprising:

reading the data blocks sequentially from the track of the magnetic tape;

determining if the data block currently being read is good or bad;

providing the data block currently being read to the host if the currently being read data block does not follow a bad data block;

if one of the data blocks is bad, storing the good data blocks following the bad data block in sequential order;

accumulating parity of the good data blocks as the data blocks are being read;

reading the parity block from the track of the magnetic tape after all of the data blocks have been read;

if one of the data blocks is bad, reconstructing the bad data block from the accumulated parity of the data blocks and the parity block in order to form a reconstructed good data block;

providing the reconstructed good data block to the host; and

providing the stored good data blocks to the host in sequential order after the reconstructed good data block has been provided to the host.

16. (TWICE AMENDED) A data storage array system for providing data blocks to a host, the system comprising:

magnetic tape having data blocks and a parity block in which the data blocks and the parity block are serially arranged on a track of the magnetic tape with the parity block following the data blocks and the parity block being based on the data blocks;

a controller for reading the data blocks sequentially from the track of the magnetic tape and for reading the parity block from the track of the magnetic tape, wherein the controller determines if the data block currently being read is good or bad, the controller providing the data block currently being read to the host if the currently being read data block does not follow a bad data block, the controller reading the parity block from the track of the magnetic tape after all of the data blocks have been read;

a buffer, wherein if one of the data blocks is bad, the buffer stores the good data blocks following the bad data block in sequential order; and

a parity accumulator for accumulating parity of the good data blocks as the controller reads the data blocks;

wherein if one of the data blocks is bad, the controller reconstructs the bad data block from the accumulated parity of the good data blocks and the parity block in order to form a reconstructed good data block;

wherein the controller provides the reconstructed good data block to the host and then provides the good data blocks stored in the buffer to the host in sequential order after the reconstructed good data block has been provided to the host.